Section 0-9: Square Roots and Simplifying Radicals

By the end of this lesson, you should be able to answer:
- How do you evaluate square roots and simplify radical expressions?

Define the following:
1. Product Property

2. Quotient Property

When simplifying a radical, we want to do as much to the radical as we can while not resorting to estimating the value. To do this, we will need to work on factoring into values so that at least one will be a perfect square until there are none left to factor.

Example 1: Simplify.
a. $\sqrt{54}$ b. $\sqrt{126}$

When simplifying powers inside of square roots, we just need to factor them into perfect squares. This means that we want to factor out the greatest power that is even, as any even power is a perfect square. When the resulting power when taking the square root is odd, make sure to take the absolute value of it to ensure the value will be positive.

Example 2: Simplify.
a. $\sqrt{80x^7y^3z^4}$ b. $\sqrt{25a^{12}r^8t^{11}}$

When dealing with quotients (fractions), just simplify the numerator and denominator separately.

Example 3: Simplify.
a. $\sqrt{\frac{25}{49}}$ b. $\sqrt{\frac{81}{16}}$

Sometimes there will be a radical in the denominator. In order to rationalize the denominator, we need to eliminate the radical. We can't just square the top and the bottom, as that would apply a change that would completely alter the value of the ratio. We *CAN*, however, multiply the numerator and denominator by the same value: that of the radical in the denominator.

Example 4: Simplify.

a. $\frac{7}{\sqrt{5}}$

b. $\frac{9}{\sqrt{12}}$

If we have more than just one term in the denominator where one is a radical, we need to multiply the numerator and denominator both by what is know as the conjugate. The conjugate of $p\sqrt{q}+r\sqrt{t}$ is $p\sqrt{q}-r\sqrt{t}$.

Example 5: Simplify.

a. $\frac{4}{1-\sqrt{7}}$

b. $\frac{5}{6+\sqrt{8}}$

Problem Set:

"Hold yourself responsible for a higher standard than anyone else expects of you. Never excuse yourself." - Henry Ward Beecher